

# MATH 093 Descriptive Statistics with Algebra (5 Credits)



## Course Description

Based on the Statway curriculum for teaching statistics with integrated algebra. Introduction to descriptive statistics. Topics include data analysis and statistical studies, graphical and tabular summaries of data, measures of central tendency and variability, basic probability, functions, linear equations, linear regression and two-way tables. Preparation course for MATH-136.

Prerequisite(s): MATH-085 with a "C" or higher, or appropriate placement; READ-095 with a "C" or higher, or concurrent registration with READ-095, or assessment above READ-095.

## Course Outcomes

Upon successful completion of the course, the student should be able to

1. Compare proportional relationships that may be represented in different ways and demonstrate understanding of the role and function of  $k$  in the relationship  $y = kx$ . Represent real-world and quantitative relationships with equations, inequalities, expressions, tables, verbal descriptions, symbols, and graphs.
2. Solve equations and inequalities and explain how results relate to the original context.
3. Represent a function algebraically and be able to compute values of a function.
4. Describe a function verbally, algebraically, graphically, and in a table of values, and make connections among representations.
5. Make conjectures about the behavior of a function given several values of the function and a given context.
6. Model situations with linear, quadratic, and exponential functions, inequalities and equations.
7. Investigate graphically and numerically (with technology) the effect of changing a parameter within a model.
8. For linear functions students will be able to:
  - a. Model situations involving constant rates of change.
  - b. Describe the constant of proportionality, slope, as the rate of change of the function using appropriate units.
  - c. Given the graph, an equation, or two or more points on a line, determine and interpret the intercept(s) and slope.
  - d. Given a set of points that exhibit a linear trend, determine the line of best fit.
  - e. Compute and interpret the errors or deviation from a line of best fit using linear regression that is used to model a data set with a linear trend.
9. Develop a plan for a statistical study.
  - a. Given a real-world problem, formulate a question that can be addressed by data.
  - b. Identify appropriate data that can be used to address the question.
  - c. Select an appropriate data collection strategy to address a question of interest.
10. Determine the type and scope of conclusions that can be drawn from different types of statistical studies (e.g., surveys, other observational studies, experiments).
11. Use characteristics of good sampling plans (e.g., representative of larger population, minimize sources of bias and variability), well-designed experiments (e.g., random assignment, replication, control, blocking), and well-designed observational studies (e.g., recognizing potential sources of bias).

- 12.** Critically evaluate all aspects of a study.
- 13.** Use logic and reasoning used to interpret results from different types of statistical studies, including surveys, other observational studies, and experiments.
- 14.** Determine what statistical methods are appropriate in a given situation based on the goal of the analysis and the data available, and know and assess the conditions required for appropriate use of a given statistical method.
- 15.** Demonstrate a basic understanding of probability.
  - a.** Interpret a probability.
  - b.** Estimate probabilities (including conditional probabilities) empirically and using simulation.
  - c.** Use a probability distribution to model behavior of a variable.
  - d.** Use sampling distributions to model the behavior of a sample statistic (e.g., a sample mean or sample proportion).
- 16.** Demonstrate understanding of how sampling distributions and probability support drawing conclusions based on data and assessing the associated risks.
- 17.** Create, formulate and evaluate written reports of probabilistic and statistical information.
- 18.** Use technology such as a computer spreadsheet or graphical calculator to perform statistical calculations.

# MATH 136 Inferential Statistics

## (5 Credits)



### Course Descriptions

Based on the Statway curriculum for teaching statistics with integrated algebra. Introduction to inferential statistics. Topics include modeling with linear, exponential and quadratic functions, probability distributions, confidence intervals and hypothesis testing for one and two sample proportions and means tests. Completion of MATH-136 is equivalent to completion of MATH&-146.

**Prerequisite(s):** MATH-093 with a "C" or higher.

### Course Outcomes

1. Investigate graphically and numerically (with technology) the effect of changing a parameter within a model.
2. For exponential functions students will be able to:
  - a. Identify and quantify exponential growth or decay in formulas, graphs, tables, and applications.
  - b. Characterize and describe exponential models and compare them to other models.
  - c. Represent relationships between variables in involving exponential growth and decay.
  - d. Describe transformations of the graphs of exponential functions.
3. Model situations with linear, quadratic functions, inequalities and equations.
4. Interpret results from different types of statistical studies, including surveys, other observational studies, and experiments using logic and reasoning.
5. Determine what statistical methods are appropriate in a given situation based on the goal of the analysis and the data available, and know and assess the conditions required for appropriate use of a given statistical method.
6. Critically evaluate whether conclusions based on data are reasonable.
7. Compute confidence interval estimates and interpret confidence intervals, confidence level, and margin of error in context.
8. In a given context, determine appropriate null and alternative hypotheses and understand what conclusions reasonably follow from a decision to reject the null hypothesis and from a decision not to reject the null hypothesis.
9. Demonstrate an understanding of statistical significance, including significance levels and P-values.
10. Carry out hypothesis tests to reach a conclusion and communicate the conclusion in context.
11. Create, formulate and evaluate written reports of probabilistic and statistical information.
12. Use technology such as a computer spreadsheet or graphical calculator to perform statistical calculations.